

## Instituto Geográfico Nacional of Spain

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### Abstract

This report updates the description of the OAN facilities as an IVS network station. The new 40-m radiotelescope performed the first geodetic VLBI observations in September 2008. While commissioning for other frequencies is in progress, the instrument will participate regularly in IVS campaigns in 2009.

### 1. General Information: the IGN Facilities at OAN-Yebes

The Observatorio Astronómico Nacional (OAN) of Spain is a department of the Instituto Geográfico Nacional (IGN, Ministerio de Fomento) and operates a new 40-m radiotelescope at Yebes (Guadalajara, Spain). The facility also includes an old 14-m radiotelescope, which was a network station of the IVS and participated regularly in the geodetic VLBI campaigns until 2003. It is being refurbished to become a tracking station for the next space radiotelescope VSOP-2.

Yebes is also the reference station for the Spanish GPS network. A building has been finished to hold the IGN gravimeters.

### 2. IGN-OAN Staff Working on VLBI Projects

Table 1 lists the OAN staff who are involved in geodetic VLBI studies and operations. The VLBI activities are also supported by other staff such as receiver engineers, computer managers, secretaries, and students. The hiring of dedicated telescope operators is in progress.

Table 1. Staff in the OAN VLBI group (Email: [vlbitech@oan.es](mailto:vlbitech@oan.es)).

Name	Background	Role	Address*
Francisco Colomer	Astronomer	VLBI Project coordinator	OAM
Susana García-Espada	Engineer	Ph.D. student	CAY
Jesús Gómez–González	Astronomer	Deputy Director for Astronomy, Geodesy and Geophysics	IGN
José Antonio López–Fdez	Engineer	CAY site manager	CAY
Pablo de Vicente	Astronomer	VLBI Technical coordinator	CAY

#### Addresses:

**OAM:** Observatorio Astronómico de Madrid. Calle Alfonso XII, 3. E–28014 Madrid. Spain.

**CAY:** Centro Astronómico de Yebes. Apartado 148, E–19080 Guadalajara. Spain.

**IGN:** Instituto Geográfico Nacional. Calle General Ibañez de Ibero 3, E–28003 Madrid. Spain.

Table 2. Characteristics of the Yebes 40-m geodetic VLBI station.

Parameter	Value	DAR	VLBA4 (14) + VSI-C
Diameter	40 meter	Recorder	Mark 5B
Receivers	2 - 115 GHz	H-maser	KVARTZ CH-1
S/X $T_{\text{sys}}$	180/60 K	GPS	TrueTime XL-DC
S/X SEFD	800/200 Jy	Weather station	SEAC-EMC

### 3. Status of the Geodetic VLBI Activities at OAN

The most important milestone has been the participation of the new 40-m radiotelescope in geodetic VLBI campaigns. After a first successful test at S/X bands on September 12 (R4343), regular observations started with experiment R1349 (October 20).

The cooperation with the geodesy group at Onsala Space Observatory in Sweden continued during 2008. The analysis of VLBI sessions and GPS time series was performed for the 14-m radiotelescope at the Yebes site from 1995 to 2003 (see Figure 1). For VLBI sessions, the best available apriori geophysical models and auxiliary weather information from European Center for Medium-Range Weather Forecast (ECMWF) were used. The results derived from VLBI measurements are consistent with the plate tectonic motion and no significant movements are detected. The GPS results may detect a deviation in the horizontal components, which is not supported by the VLBI results. A small relative motion between the VLBI and the GPS monuments seems to be detected (see Fig. 2).

We also started to study the HIRLAM 3D-VAR numerical weather prediction model in order to calculate a direct improved mapping function using raytracing for modelling the tropospheric effect caused by neutral atmosphere.

### 4. Future Plans

The connection of Yebes to GÉANT at 1 Gbps, thanks to the EC project EXPReS, is expected to be operational in February 2009. The construction of a network of concrete pillars around the 40-m radiotelescope to measure the reference point of the instrument and the local tie to the old 14-m radiotelescope is delayed.

### References

- [1] López-Fernández J.A., Serna-Puente J.M., Tercero F., Yagüe J.M., Abad J.A., Almendros C., Henche S., Fernández J. “Criostato de los receptores X/Ku de la antena ARIES XXI del CAY”. Informe Técnico OAN 2008-4 (see <http://www1.oan.es/informes/archivos/IT-OAN-2008-4.pdf>).
- [2] García-Espada S., Haas R., Colomer F. “Space Geodesy at Yebes: Station Motion from VLBI and GPS”. 2008. In: Proceedings of the 5<sup>th</sup> IVS General Meeting “Measuring the future”, eds A. Finkelstein, D. Behrend. s. 93-97. ISBN/ISSN: 978-5-02-025332-2 Nr. 79323.

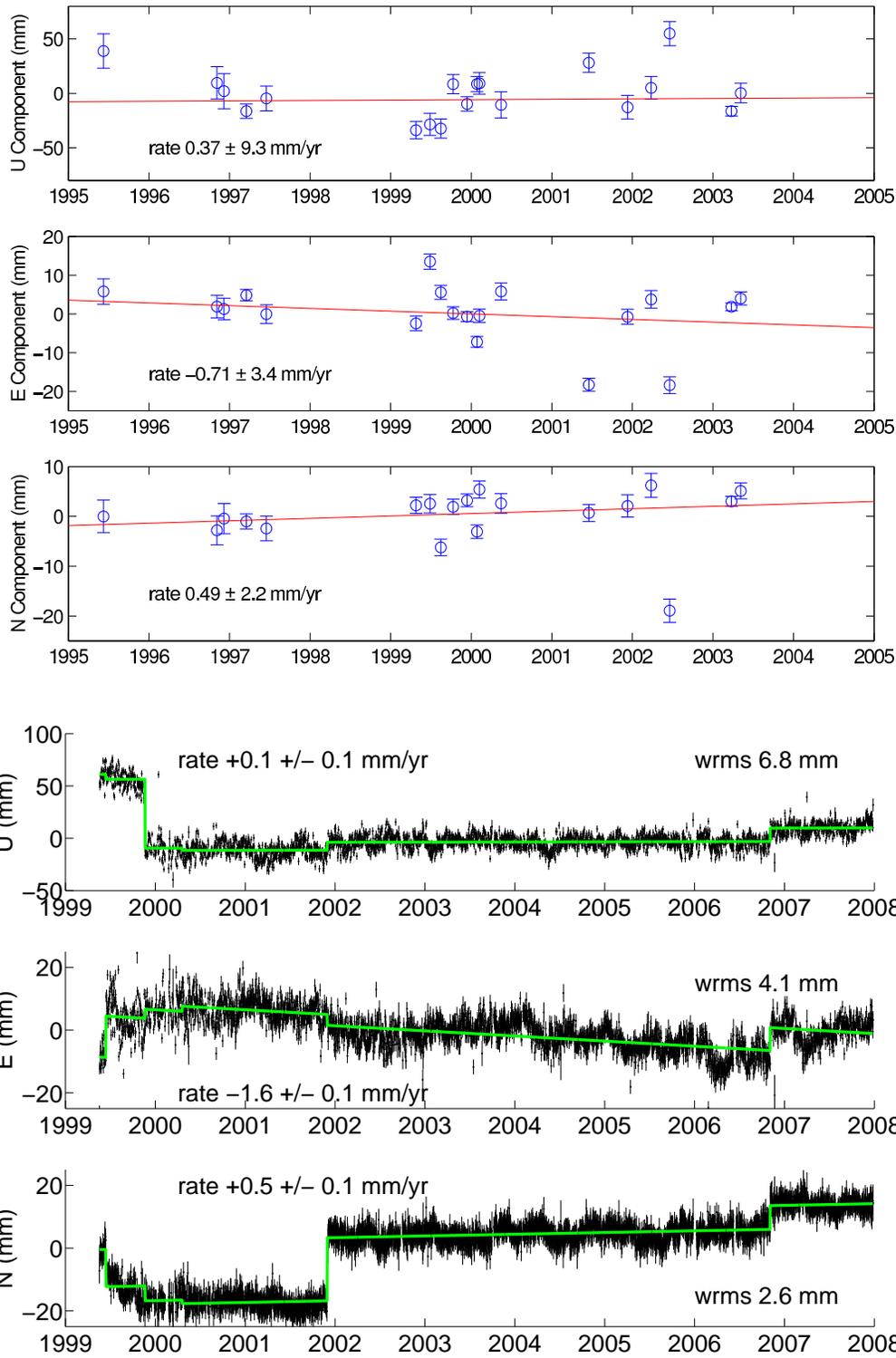


Figure 1. Time series of topocentric station positions for the Yebes VLBI (top) and GPS station (bottom). Plate motion according to Nuvel-1 has been subtracted. From García-Espada et al. (2008)

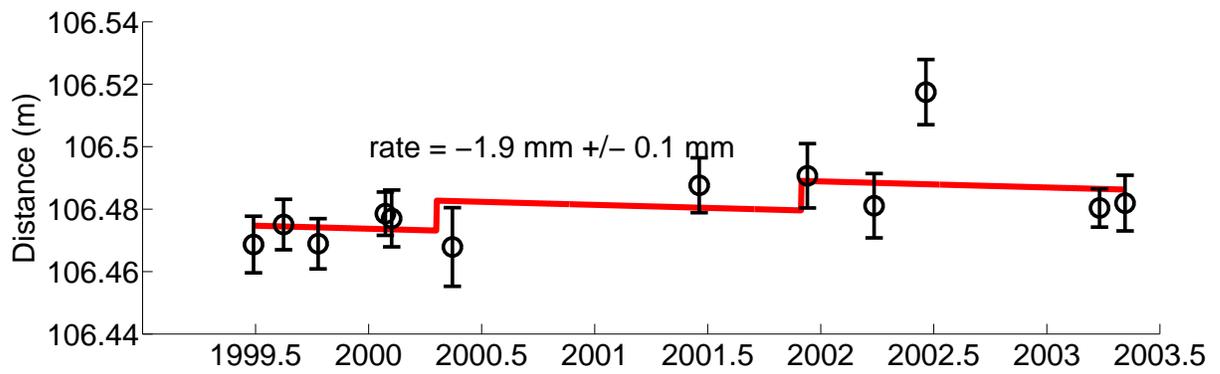


Figure 2. Time series of the distance between the VLBI and GPS monuments at Yebes. From García-Espada et al. (2008)